

## VII. COMPLIANCE AND ENFORCEMENT HISTORY

### Background

To date, EPA has focused much of its attention on measuring compliance with specific environmental statutes. This approach allows the Agency to track compliance with the Clean Air Act, the Resource Conservation and Recovery Act, the Clean Water Act, and other environmental statutes. Within the last several years, the Agency has begun to supplement single-media compliance indicators with facility-specific, multimedia indicators of compliance. In doing so, EPA is in a better position to track compliance with all statutes at the facility level, and within specific industrial sectors.

A major step in building the capacity to compile multimedia data for industrial sectors was the creation of EPA's Integrated Data for Enforcement Analysis (IDEA) system. IDEA has the capacity to "read into" the Agency's single-media databases, extract compliance records, and match the records to individual facilities. The IDEA system can match Air, Water, Waste, Toxics/Pesticides/EPCRA, TRI, and Enforcement Docket records for a given facility, and generate a list of historical permit, inspection, and enforcement activity. IDEA also has the capability to analyze data by geographic area and corporate holder. As the capacity to generate multimedia compliance data improves, EPA will make available more in-depth compliance and enforcement information. Additionally, sector-specific measures of success for compliance assistance efforts are under development.

### Compliance and Enforcement Profile Description

Using inspection, violation and enforcement data from the IDEA system, this section provides information regarding the historical compliance and enforcement activity of this sector. In order to mirror the facility universe reported in the Toxic Chemical Profile, the data reported within this section consists of records only from the TRI reporting universe. With this decision, the selection criteria are consistent across sectors with certain exceptions. For the sectors that do not normally report to the TRI program, data have been provided from EPA's Facility Indexing System (FINDS) which tracks facilities in all media databases. Please note, in this section, EPA does not attempt to define the actual number of facilities that fall within each sector. Instead, the section portrays the records of a subset of facilities within the sector that are well defined within EPA databases.

As a check on the relative size of the full sector universe, most notebooks contain an estimated number of facilities within the sector according to the Bureau of Census (See Section II). With sectors dominated by small businesses, such as metal finishers and printers, the reporting universe within the EPA databases may be small in comparison to Census data. However, the group selected for inclusion in this data analysis section

should be consistent with this sector's general make-up.

Following this introduction is a list defining each data column presented within this section. These values represent a retrospective summary of inspections and enforcement actions, and solely reflect EPA, State, and local compliance assurance activities that have been entered into EPA databases. To identify any changes in trends, the EPA ran two data queries, one for the past five calendar years (August 10, 1990 to August 9, 1995) and the other for the most recent twelve-month period (August 10, 1994 to August 9, 1995). The five-year analysis gives an average level of activity for that period for comparison to the more recent activity.

Because most inspections focus on single-media requirements, the data queries presented in this section are taken from single media databases. These databases do not provide data on whether inspections are state/local or EPA-led. However, the table breaking down the universe of violations does give the reader a crude measurement of the EPA's and states' efforts within each media program. The presented data illustrate the variations across regions for certain sectors.<sup>d</sup> This variation may be attributable to state/local data entry variations, specific geographic concentrations, proximity to population centers, sensitive ecosystems, highly toxic chemicals used in production, or historical noncompliance. Hence, the exhibited data do not rank regional performance or necessarily reflect which regions may have the most compliance problems.

## Compliance and Enforcement Data Definitions

### General Definitions

**Facility Indexing System (FINDS)** -- this system assigns a common facility number to EPA single-media permit records. The FINDS identification number allows EPA to compile and review all permit, compliance, enforcement and pollutant release data for any given regulated facility.

**Integrated Data for Enforcement Analysis (IDEA)** -- is a data integration system that can retrieve information from the major EPA program office databases. IDEA uses the FINDS identification number to "glue together" separate data records from EPA's databases. This is done to create a "master list" of data records for any given facility. Some of the data systems accessible through IDEA are: AIRS (Air Facility Indexing and Retrieval System, Office of Air and Radiation), PCS (Permit Compliance System, Office of Water), RCRIS (Resource Conservation

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<sup>d</sup> EPA Regions include the following states: I (CT, MA, ME, RI, NH, VT); II (NJ, NY, PR, VI); III (DC, DE, MD, PA, VA, WV); IV (AL, FL, GA, KY, MS, NC, SC, TN); V (IL, IN, MI, MN, OH, WI); VI (AR, LA, NM, OK, TX); VII (IA, KS, MO, NE); VIII (CO, MT, ND, SD, UT, WY); IX (AZ, CA, HI, NV, Pacific Trust Territories); X (AK, ID, OR, WA).

and Recovery Information System, Office of Solid Waste), NCDB (National Compliance Data Base, Office of Prevention, Pesticides, and Toxic Substances), CERCLIS (Comprehensive Environmental and Liability Information System, Superfund), and TRIS (Toxic Release Inventory System). IDEA also contains information from outside sources such as Dun and Bradstreet and the Occupational Safety and Health Administration (OSHA). Most data queries displayed in notebook sections IV and VII were conducted using IDEA.

### Data Table Column Heading Definitions

**Facilities in Search** -- are based on the universe of TRI reporters within the listed SIC code range. For industries not covered under TRI reporting requirements, the notebook uses the FINDS universe for executing data queries. The SIC code range selected for each search is defined by each notebook's selected SIC code coverage described in Section II.

**Facilities Inspected** --- indicates the level of EPA and state agency inspections for the facilities in this data search. These values show what percentage of the facility universe is inspected in a 12 or 60 month period.

**Number of Inspections** -- measures the total number of inspections conducted in this sector. An inspection event is counted each time it is entered into a single media database.

**Average Time Between Inspections** -- provides an average length of time, expressed in months, between compliance inspections at a facility within the defined universe.

**Facilities with One or More Enforcement Actions** -- expresses the number of facilities that were the subject of at least one enforcement action within the defined time period. This category is broken down further into federal and state actions. Data are obtained for administrative, civil/judicial, and criminal enforcement actions. Administrative actions include Notices of Violation (NOVs). A facility with multiple enforcement actions is only counted once in this column (facility with 3 enforcement actions counts as 1).

**Total Enforcement Actions** -- describes the total number of enforcement actions identified for an industrial sector across all environmental statutes. A facility with multiple enforcement actions is counted multiple times (a facility with 3 enforcement actions counts as 3).

**State Lead Actions** -- shows what percentage of the total enforcement actions are taken by state and local environmental agencies. Varying levels of use by states of EPA data systems may limit the volume of actions accorded state enforcement activity. Some states extensively report enforcement activities into EPA data systems, while other states

may use their own data systems.

**Federal Lead Actions** -- shows what percentage of the total enforcement actions are taken by the United States Environmental Protection Agency. This value includes referrals from state agencies. Many of these actions result from coordinated or joint state/federal efforts.

**Enforcement to Inspection Rate** -- expresses how often enforcement actions result from inspections. This value is a ratio of enforcement actions to inspections, and is presented for comparative purposes only. This measure is a rough indicator of the relationship between inspections and enforcement. This measure simply indicates historically how many enforcement actions can be attributed to inspection activity. Reported inspections and enforcement actions under the Clean Water Act (CWA), the Clean Air Act (CAA) and the Resource Conservation and Recovery Act (RCRA) are included in this ratio. Inspections and actions from the TSCA/FIFRA/ EPCRA database are not factored into this ratio because most of the actions taken under these programs are not the result of facility inspections. This ratio does not account for enforcement actions arising from non-inspection compliance monitoring activities (e.g., self-reported water discharges) that can result in enforcement action within the CAA, CWA, and RCRA.

**Facilities with One or More Violations Identified** -- indicates the percentage of inspected facilities having a violation identified in one of the following data categories: In Violation or Significant Violation Status (CAA); Reportable Noncompliance, Current Year Noncompliance, Significant Noncompliance (CWA); Noncompliance and Significant Noncompliance (FIFRA, TSCA, and EPCRA); Unresolved Violation and Unresolved High Priority Violation (RCRA). The values presented for this column reflect the extent of noncompliance within the measured time frame, but do not distinguish between the severity of the noncompliance. Violation status may be a precursor to an enforcement action, but does not necessarily indicate that an enforcement action will occur.

**Media Breakdown of Enforcement Actions and Inspections** -- four columns identify the proportion of total inspections and enforcement actions within EPA Air, Water, Waste, and TSCA/FIFRA/EPCRA databases. Each column is a percentage of either the "Total Inspections," or the "Total Actions" column.

**VII.A. Iron and Steel Industry Compliance History**

Exhibit 14 provides an overview of the reported compliance and enforcement data for the iron and steel industry over the past five years (August 1990 to August 1995). These data are also broken out by EPA Region thereby permitting geographical comparisons. A few points evident from the data are listed below.

- Eighty-five percent of iron and steel facility inspections occurred in Regions III, IV, and V, where the most facilities are located.
- Within the three regions where iron and steel mills are concentrated, the proportion of state-lead enforcement actions was significantly greater than federal action for Regions III and IV (87% state-lead and 91% state-lead, respectively). In Region V, the region with the greatest number of iron and steel facilities, enforcement actions were fairly evenly split between state-lead and federal-lead.
- Of the 275 facilities inspected over the five-year period examined, 115 had one or more enforcement actions (42%), however, the aggregate Enforcement to Inspection Rate across all Regions was 0.14 (499 enforcement actions/3,555 inspections).

Exhibit 14: Five-Year Enforcement and Compliance Summary for Iron and Steel									
A	B	C	D	E	F	G	H	I	J
Region	Facilities in Search	Facilities Inspected	Number of Inspections	Average Months Between Inspections	Facilities with 1 or More Enforcement Actions	Total Enforcement Actions	Percent State Lead Actions	Percent Federal Lead Actions	Enforcement to Inspection Rate
I	17	11	37	28	6	9	78%	22%	0.24
II	23	19	184	8	8	21	76%	24%	0.11
III	79	68	962	5	26	135	87%	13%	0.14
IV	59	46	907	4	24	133	87%	13%	0.15
V	135	92	1,143	7	36	98	48%	52%	0.09
VI	32	21	185	10	7	59	39%	61%	0.32
VII	10	7	43	14	2	7	14%	86%	0.16
VIII	5	3	29	10	2	6	83%	17%	0.21
IX	11	6	23	29	3	21	100%	0%	0.91
X	3	2	42	4	1	10	50%	50%	0.24
TOTAL	374	275	3,555	6	115	499	72%	28%	0.14

**VII.B. Comparison of Enforcement Activity Between Selected Industries**

Exhibits 15 and 16 allow the compliance history of the iron and steel sector to be compared to the other industries covered by the industry sector notebooks. Comparisons between Exhibits 15 and 16 permit the identification of trends in compliance and enforcement records of the industry by comparing data covering the last five years to that of the past year. Some points evident from the data are listed below.

- Of those sectors listed, facilities in iron and steel sector have been one of the most frequently inspected industries over the past five years with an average of 6 months between inspections. Only petroleum refining and pulp and paper facilities were inspected, on average, more frequently.
- Over the past year, the enforcement to inspection rate for the iron and steel industry has decreased from 0.14 for 1990 through 1995 to 0.09 for August 1994 through August 1995.

Exhibits 17 and 18 provide a more in-depth comparison between iron and steel industry and other sectors by breaking out the compliance and enforcement data by environmental statute. As in the previous Exhibits (Exhibits 15 and 16), the data cover the last five years (Exhibit 17) and the last one year (Exhibit 18) to facilitate the identification of recent trends. A few points evident from the data are listed below.

- The percentage of inspections carried out under each environmental statute has changed little between the average of the past five years and that of the past year. Inspections are roughly divided equally among, CAA, CWA, and RCRA, although the past year has shown a slight increase in the percentage of CAA inspections and a slight decrease in the percentage of RCRA inspections.
- While approximately one-third of inspections are carried out under each statute (CAA, CWA, and RCRA), the majority of the enforcement actions are taken under RCRA.



Exhibit 15: Five-Year Enforcement and Compliance Summary for Selected Industries									
A	B	C	D	E	F	G	H	I	J
Industry Sector	Facilities in Search	Facilities Inspected	Number of Inspections	Average Months Between Inspections	Facilities with 1 or More Enforcement Actions	Total Enforcement Actions	Percent State Lead Actions	Percent Federal Lead Actions	Enforcement to Inspection Rate
Pulp and Paper	306	265	3,766	5	115	502	78%	22%	0.13
Printing	4,106	1,035	4,723	52	176	514	85%	15%	0.11
Inorganic Chemicals	548	298	3,034	11	99	402	76%	24%	0.13
Organic Chemicals	412	316	3,864	6	152	726	66%	34%	0.19
Petroleum Refining	156	145	3,257	3	110	797	66%	34%	0.25
<b>Iron and Steel</b>	<b>374</b>	<b>275</b>	<b>3,555</b>	<b>6</b>	<b>115</b>	<b>499</b>	<b>72%</b>	<b>28%</b>	<b>0.14</b>
Dry Cleaning	933	245	633	88	29	103	99%	1%	0.16
Metal Mining	873	339	1,519	34	67	155	47%	53%	0.10
Non-Metallic Mineral Mining	1,143	631	3,422	20	84	192	76%	24%	0.06
Lumber and Wood	464	301	1,891	15	78	232	79%	21%	0.12
Furniture	293	213	1,534	11	34	91	91%	9%	0.08
Rubber and Plastic	1,665	739	3,386	30	146	391	78%	22%	0.12
Stone, Clay, and Glass	468	268	2,475	11	73	301	70%	30%	0.12
Fabricated Metal	2,346	1,340	5,509	26	280	840	80%	20%	0.15
Nonferrous Metal	844	474	3,097	16	145	470	76%	24%	0.15
Electronics	405	222	777	31	68	212	79%	21%	0.27
Automobiles	598	390	2,216	16	81	240	80%	20%	0.11

Exhibit 16: One-Year Inspection and Enforcement Summary for Selected Industries									
A	B	C	D	E		F		G	H
Industry Sector	Facilities in Search	Facilities Inspected	Number of Inspections	Facilities with 1 or More Violations		Facilities with 1 or more Enforcement Actions		Total Enforcement Actions	Enforcement to Inspection Rate
				Number	Percent*	Number	Percent*		
Pulp and Paper	306	189	576	162	86%	28	15%	88	0.15
Printing	4,106	397	676	251	63%	25	6%	72	0.11
Inorganic Chemicals	548	158	427	167	106%	19	12%	49	0.12
Organic Chemicals	412	195	545	197	101%	39	20%	118	0.22
Petroleum Refining	156	109	437	109	100%	39	36%	114	0.26
Iron and Steel	374	167	488	165	99%	20	12%	46	0.09
Dry Cleaning	933	80	111	21	26%	5	6%	11	0.10
Metal Mining	873	114	194	82	72%	16	14%	24	0.13
Non-metallic Mineral Mining	1,143	253	425	75	30%	28	11%	54	0.13
Lumber and Wood	464	142	268	109	77%	18	13%	42	0.58
Furniture	293	160	113	66	41%	3	2%	5	0.55
Rubber and Plastic	1,665	271	435	289	107%	19	7%	59	0.14
Stone, Clay, and Glass	468	146	330	116	79%	20	14%	66	0.20
Nonferrous Metals	844	202	402	282	104%	22	11%	72	0.18
Fabricated Metal	2,346	477	746	525	110%	46	10%	114	0.15
Electronics	405	60	87	80	133%	8	13%	21	0.24
Automobiles	598	169	284	162	96%	14	8%	28	0.10
* Percentages in Columns E and F are based on the number of facilities inspected (Column C). Percentages can exceed 100% because violations and actions can occur without a facility inspection.									

\* Percentages in Columns E and F are based on the number of facilities inspected (Column C). Percentages can exceed 100% because violations and actions can occur without a facility inspection.

Exhibit 17: Five-Year Inspection and Enforcement Summary by Statute for Selected Industries											
Industry Sector	Facilities Inspected	Total Inspections	Total Enforcement Actions	Clean Air Act		Clean Water Act		Resource Conservation and Recovery Act		FIFRA/TSCA/EPCRA/Other	
				% of Total Inspections	% of Total Actions	% of Total Inspections	% of Total Actions	% of Total Inspections	% of Total Actions	% of Total Inspection	% of Total Actions
Pulp and Paper	265	3,766	502	51%	48%	38%	30%	9%	18%	2%	3%
Printing	1,035	4,723	514	49%	31%	6%	3%	43%	62%	2%	4%
Inorganic Chemicals	298	3,034	402	29%	26%	29%	17%	39%	53%	3%	4%
Organic Chemicals	316	3,864	726	33%	30%	16%	21%	46%	44%	5%	5%
Petroleum Refining	145	3,237	797	44%	32%	19%	12%	35%	52%	2%	5%
<b>Iron and Steel</b>	<b>275</b>	<b>3,555</b>	<b>499</b>	<b>32%</b>	<b>20%</b>	<b>30%</b>	<b>18%</b>	<b>37%</b>	<b>58%</b>	<b>2%</b>	<b>5%</b>
Dry Cleaning	245	633	103	15%	1%	3%	4%	83%	93%	0%	1%
Metal Mining	339	1,519	155	35%	17%	57%	60%	6%	14%	1%	9%
Non-metallic Mineral Mining	631	3,422	192	65%	46%	31%	24%	3%	27%	0%	4%
Lumber and Wood	301	1,891	232	31%	21%	8%	7%	59%	67%	2%	5%
Furniture	293	1,534	91	52%	27%	1%	1%	45%	64%	1%	8%
Rubber and Plastic	739	3,386	391	39%	15%	13%	7%	44%	68%	3%	10%
Stone, Clay, and Glass	268	2,475	301	45%	39%	15%	5%	39%	51%	2%	5%
Nonferrous Metals	474	3,097	470	36%	22%	22%	13%	38%	54%	4%	10%
Fabricated Metal	1,340	5,509	840	25%	11%	15%	6%	56%	76%	4%	7%
Electronics	222	777	212	16%	2%	14%	3%	66%	90%	3%	5%
Automobiles	390	2,216	240	35%	15%	9%	4%	54%	75%	2%	6%

Exhibit 18: One-Year Inspection and Enforcement Summary by Statute for Selected Industries											
Industry Sector	Facilities Inspected	Total Inspections	Total Enforcement Actions	Clean Air Act		Clean Water Act		Resource Conservation and Recovery Act		FIFRA/TSCA/EPCRA/Other	
				% of Total Inspections	% of Total Actions	% of Total Inspections	% of Total Actions	% of Total Inspections	% of Total Actions	% of Total Inspections	% of Total Actions
Pulp and Paper	189	576	88	56%	69%	35%	21%	10%	7%	0%	3%
Printing	397	676	72	50%	27%	5%	3%	44%	66%	0%	4%
Inorganic Chemicals	158	427	49	26%	38%	29%	21%	45%	36%	0%	6%
Organic Chemicals	195	545	118	36%	34%	13%	16%	50%	49%	1%	1%
Petroleum Refining	109	437	114	50%	31%	19%	16%	30%	47%	1%	6%
<b>Iron and Steel</b>	<b>167</b>	<b>488</b>	<b>46</b>	<b>29%</b>	<b>18%</b>	<b>35%</b>	<b>26%</b>	<b>36%</b>	<b>50%</b>	<b>0%</b>	<b>6%</b>
Dry Cleaning	80	111	11	21%	4%	1%	22%	78%	67%	0%	7%
Metal Mining	114	194	24	47%	42%	43%	34%	10%	6%	0%	19%
Non-metallic Mineral Mining	253	425	54	69%	58%	26%	16%	5%	16%	0%	11%
Lumber and Wood	142	268	42	29%	20%	8%	13%	63%	61%	0%	6%
Furniture	293	160	5	58%	67%	1%	10%	41%	10%	0%	13%
Rubber and Plastic	271	435	59	39%	14%	14%	4%	46%	71%	1%	11%
Stone, Clay, and Glass	146	330	66	45%	52%	18%	8%	38%	37%	0%	3%
Nonferrous Metals	202	402	72	33%	24%	21%	3%	44%	69%	1%	4%
Fabricated Metal	477	746	114	25%	14%	14%	8%	61%	77%	0%	2%
Electronics	60	87	21	17%	2%	14%	7%	69%	87%	0%	4%
Automobiles	169	284	28	34%	16%	10%	9%	56%	69%	1%	6%

## VII.C. Review of Major Legal Action

### Major Cases/Supplemental Environmental Projects

This section provides summary information about major cases that have affected this sector, and a list of Supplemental Environmental Projects (SEPs). SEPs are compliance agreements that reduce a facility's non-compliance penalty in return for an environmental project that exceeds the value of the reduction. Often, these projects fund pollution prevention activities that can significantly reduce the future pollutant loadings of a facility.

#### VII.C.1. Review of Major Cases

The Office of Regulatory Enforcement does not regularly compile information related to major cases and pending litigation within an industry sector. The staff are willing to pass along such information to Agency staff as requests are made. (Contact: Pete Rosenberg 202-260-8869) In addition, summaries of completed enforcement actions are published each fiscal year in the *Enforcement Accomplishments Report*; the summaries are not organized by industry sector. (Contact: Robert Banks 202-260-8296).

#### VII.C.2. Supplementary Environmental Projects (SEPs)

Supplemental environmental projects (SEPs) are enforcement options that require the non-compliant facility to complete specific projects. Regional summaries of SEPs undertaken in the 1993 and 1994 federal fiscal years were reviewed. Three projects were undertaken that involved iron and steel facilities, as shown in Exhibit 19.

In the iron and steel sector, SEPs resulted from violations of EPCRA, CERCLA, and RCRA. Due to differences in regional descriptions, the specifics of the original violations are not known. The cost for the projects ranged from \$53,000 to \$900,000 corresponding to initial penalties ranging from \$110,000 to \$746,438.

<b>Exhibit 19: FY-1993-1994 Supplemental Environmental Projects Overview: Iron and Steel Manufacture</b>											
General Information			Violation Information				Pollution Reduction				
FY	Docket #	Company Name	State/Region	Type	Initial Penalty	Final Penalty	SEP Credit	SEP Cost to Company	Pollutant Concern	Pollutant Reduction	Supplemental Environmental Project Description
93	---	Inland Steel Co.	IN	EPCRA 313	\$260,000	\$100,000	---	\$165,000	Perchloroethylene	200,000 lbs/yr	Parts cleaning process modified by replacing perchloroethylene with a non-toxic
93	---	Follansbee Steel Division of the Louis Berkman Company	WV	CERCLA	\$110,000	\$72,250	\$17,250	\$53,000	Zinc compounds Sulfuric Acid	500 to 1,000 lb/yr air, 40,000 lb/yr zinc (100%)	Zinc preflux process eliminated and sulfuric acid spillage control installed
94	---	Indiana Steel and Wire/G.K. Technologies	IN	RCRA	\$746,438	\$425,000	---	\$900,000	Ammonia	---	Will eliminate ammonia emissions through conversion of zinc plating line bath to eliminate the use of anhydrous ammonia
<b>Violation Information Terms</b> Initial penalty: Initial proposed cash penalty for violation Final penalty: Total penalty after SEP negotiation SEP credit: Cash credit given for SEP so that, Final penalty - SEP credit = Final cash penalty SEP cost to company: Actual cost to company of SEP implementation  NOTE: Due to differences in terminology and level of detail between regional SEP information, in some cases the figure listed as Final penalty may be the Final cash penalty after deduction for SEP credit											



## VIII. COMPLIANCE ACTIVITIES AND INITIATIVES

This section highlights the activities undertaken by this industry sector and public agencies to voluntarily improve the sector's environmental performance. These activities include those independently initiated by industrial trade associations. In this section, the notebook also contains a listing and description of national and regional trade associations.

### VIII.A. Sector-related Environmental Programs and Activities

#### *Common Sense Initiative*

The EPA's Common Sense Initiative (CSI) was announced in November of 1993 to encourage pollution prevention in a few pilot industrial sectors including: iron and steel, electronics, metal plating and finishing, automobiles, printing, and oil refining. The program shifts regulatory focus from concentrating on individual toxic chemicals and media, to industry-wide approaches to environmental problems. A subcommittee will be formed for each industry and a strategic plan will be drawn up to identify opportunities to coordinate rulemaking, to streamline record-keeping and permitting requirements, and to identify innovative approaches in pollution prevention and environmental technology. For the iron and steel industry, a subcommittee has been formed and four workgroups have been established. The workgroups include representatives from industry, EPA (federal and regional), state environmental agencies, public interest groups, trade associations, and research institutions. The iron and steel CSI workgroups include: Innovative Technology, Permits Process, Compliance, and Brownfields. Projects proposed by each of the workgroups are subject to approval by the subcommittee. Project approval is expected in May, 1995. Common Sense Initiative contacts at EPA are:

Designated Federal Official (EPA Office of Water):  
Mahesh Podar, 202-260-5387

Subcommittee Co-Chair (EPA Office of Water):  
Bob Perciasepe, 202-260-5700

Subcommittee Co-Chair (EPA Region V):  
Dave Ullrich, 312-886-3000

OECA contact (Compliance Workgroup):  
Maria Malave, 202-564-7027

OECA contact (Permits Process Workgroup):  
Mike Calhoun, 202-564-6031



**VIII.B. EPA Voluntary Programs***33/50 Program*

The "33/50 Program" is EPA's voluntary program to reduce toxic chemical releases and transfers of seventeen chemicals from manufacturing facilities. Participating companies pledge to reduce their toxic chemical releases and transfers by 33% as of 1992 and by 50% as of 1995 from the 1988 baseline year. Certificates of Appreciation have been given out to participants meeting their 1992 goals. The list of chemicals includes seventeen high-use chemicals reported in the Toxics Release Inventory. Exhibit 20 lists those companies participating in the 33/50 program that reported the SIC code 331 to TRI. Many of the companies shown listed multiple SIC codes and, therefore, are likely to carry out operations in addition to the iron and steel industry. The SIC codes reported by each company are listed in no particular order. In addition, the number of facilities within each company that are participating in the 33/50 program and that report SIC 331 to TRI is shown. Finally, each company's total 1993 releases and transfers of 33/50 chemicals and the percent reduction in these chemicals since 1988 are presented.

Thirteen of the seventeen target chemicals are used in the iron and steel industry. Of all TRI chemicals released by the iron and steel industry, chromium and chromium compounds, a 33/50 target chemical, were released most frequently (from 347 facilities), and were the third greatest volume. Other target chemicals that were in the top ten TRI releases by volume and by number of facilities reporting that chemical released were nickel and nickel compounds, lead and lead compounds, and 1,1,1-trichloroethane. Approximately twelve percent of eligible iron and steel companies are currently participating in the program. Exhibit 20 shows that 49 companies comprised of 115 facilities reporting SIC 331 are participating in the 33/50 program. (Contact: Mike Burns 202-260-6394 or 33/50 Program 202-260-6907).

<b>Exhibit 20: SIC 331 Facilities Participating in the EPA's 33/50 Program</b>					
<b>Parent Company</b>	<b>City, State</b>	<b>SIC Codes Reported</b>	<b>Number of Participating Facilities</b>	<b>1993 Releases and Transfers (lbs)</b>	<b>% Reduction 1988 to 1993</b>
Acme Metals Inc.	Riverdale, IL	3312, 3499, 3479	3	157,232	38
Allegheny Ludlum Corporation	Pittsburgh, PA	3312	8	1,031,164	*
American Cast Iron Pipe Co.	Birmingham, AL	3322, 3317, 3325	1	315,184	25
Ameron Inc Delaware	Pasadena, CA	3272, 3317, 3443	1	184,882	**
Amsted Industries Incorporated	Chicago, IL	3315, 3496, 3471	1	1,834,493	66
Armco Inc.	Pittsburgh, PA	3312	11	1,849,709	4
Armco Steel Company L.P.	Middletown, OH	3312	2	159,944	*
Avesta Sheffield Holding Co.	New Castle, IN	3312	1	27,025	99
Bayou Steel Corporation	La Place, LA	3312	1	1,892	98
Bethlehem Steel Corporation	Bethlehem, PA	3312	9	792,550	50
Cargill Detroit Corporation	Clawson, MI	3312	8	717,558	31
Carpenter Technology Corp.	Reading, PA	3312	1	57,155	86
CF&L Steel Corp.	Pueblo, CO	3312	1	308,892	50
Commercial Metals Company	Dallas, TX	3312	3	36,457	47
Contran Corporation	Dallas, TX	3312, 3315	1	735,655	50
Cooper Industries Inc.	Houston, TX	3462, 3317	1	1,048,465	75
CSC Industries Inc.	Warren, OH	3312	1	8,808	50
Emerson Electric Co.	Saint Louis, MO	3469, 3315	1	2,140,497	50
First Mississippi Corporation	Jackson, MS	3312	1	200,977	***
Ford Motor Company	Dearborn, MI	3312	1	15,368,032	15
Geneva Steel	Orem, UT	3312, 3317, 3325	1	12,448	***
Inland Steel Industries Inc.	Chicago, IL	3312, 3274	1	733,786	48
J & L Specialty Steel Inc.	Pittsburgh, PA	3312	2	669,309	100
Kanthal Furnace Prods.	Bethel, CT	3315, 3316, 3357	1	21,581	41
Katy Industries Inc.	Englewood, CO	3316, 3351, 3353	1	82,256	52
Kerr-Mcgee Corporation	Oklahoma City, OK	2819, 3313	1	374,098	35
LTV Steel Co. Inc.	Cleveland, OH	3312	7	612,924	60
Lukens Inc.	Coatesville, PA	3312	4	312,442	14
Naco Inc.	Lisle, IL	3313	1	71,800	***
National Steel Corporation	Mishawaka, IN	3312	2	682,386	50
Olin Corporation	Stamford, CT	3351, 3316, 3356	1	574,673	70
Oregon Steel Mills Inc.	Portland, OR	3312, 3295	1	14,533	12
Plymouth Tube Company	Warrenville, IL	3499, 3317	1	76,694	*
Renco Group Inc.	New York, NY	3312	2	204,629	7
Republic Engineered Steels	Massillon, OH	3312	4	193,662	3

<b>Exhibit 20: SIC 331 Facilities Participating in the EPA's 33/50 Program</b>					
<b>Parent Company</b>	<b>City, State</b>	<b>SIC Codes Reported</b>	<b>Number of Participating Facilities</b>	<b>1993 Releases and Transfers (lbs)</b>	<b>% Reduction 1988 to 1993</b>
Roanoke Electric Steel Corp.	Roanoke, VA	3312	1	476	***
S K W Alloys Inc.	Niagara Falls, NY	3313	1	7,777	*
Slater Steels Corporation	Fort Wayne, IN	3312	1	22,205	50
Swva Inc.	Huntington, WV	3312	1	43,405	27
Talley Industries Inc.	Phoenix, AZ	3312	1	3,804	***
Texas Industries Inc.	Dallas, TX	3312	1	20,964	*
Thomas Steel Strip Corp.	Warren, OH	3471, 3316	1	6,839	50
Timken Co.	Canton, OH	3312	5	278,695	30
Toledo Coke Corporation	Toledo, OH	3312	1	18	90
USS Posco Industries	Pittsburg, CA	3312	1	182,431	56
USX Corporation	Pittsburgh, PA	3312	6	1,510,772	25
Walter Industries Inc.	Tampa, FL	3312	1	859,751	***
Weirton Steel Corporation	Weirton, WV	3312	1	183,497	**
Wheeling-Pittsburgh Corp.	Wheeling, WV	3312	6	560,055	66
<b>Total</b>			<b>115</b>		
* = not quantifiable against 1988 data.					
** = use reduction goal only.					
*** = no numerical goal.					
Source: U.S. EPA, Toxics Release Inventory, 1993.					

### *Environmental Leadership Program*

The Environmental Leadership Program (ELP) is a national initiative piloted by EPA and state agencies in which facilities have volunteered to demonstrate innovative approaches to environmental management and compliance. EPA has selected 12 pilot projects at industrial facilities and federal installations which will demonstrate the principles of the ELP program. These principles include: environmental management systems, multimedia compliance assurance, third-party verification of compliance, public measures of accountability, community involvement, and mentor programs. In return for participating, pilot participants receive public recognition and are given a period of time to correct any violations discovered during these experimental projects. In the iron and steel industry, one company (California Steel of Fontana, California) submitted a proposal. (Contact: Tai-ming Chang, ELP Director, 202-564-5081 or Robert Fentress, 202-564-7023.)

*Project XL*

Project XL was initiated in March 1995 as a part of President Clinton's *Reinventing Environmental Regulation* initiative. The projects seek to achieve cost effective environmental benefits by allowing participants to replace or modify existing regulatory requirements on the condition that they produce greater environmental benefits. EPA and program participants will negotiate and sign a Final Project Agreement, detailing specific objectives that the regulated entity shall satisfy. In exchange, EPA will allow the participant a certain degree of regulatory flexibility and may seek changes in underlying regulations or statutes. Participants are encouraged to seek stakeholder support from local governments, businesses, and environmental groups. EPA hopes to implement fifty pilot projects in four categories, including facilities, sectors, communities, and government agencies regulated by EPA. Applications will be accepted on a rolling basis and projects will move to implementation within six months of their selection. For additional information regarding XL projects, including application procedures and criteria, see the May 23, 1995 Federal Register Notice, or contact Jon Kessler at EPA's Office of Policy Analysis (202) 260-4034.

*Green Lights Program*

EPA's Green Lights program was initiated in 1991 and has the goal of preventing pollution by encouraging U.S. institutions to use energy-efficient lighting technologies. The program has over 1,500 participants which include major corporations; small and medium sized businesses; federal, state and local governments; non-profit groups; schools; universities; and health care facilities. Each participant is required to survey their facilities and upgrade lighting wherever it is profitable. EPA provides technical assistance to the participants through a decision support software package, workshops and manuals, and a financing registry. EPA's Office of Air and Radiation is responsible for operating the Green Lights Program. (Contact: Susan Bullard at 202-233-9065 or the Green Light/Energy Star Hotline at 202-775-6650)

*WasteWi\$e Program*

The WasteWi\$e Program was started in 1994 by EPA's Office of Solid Waste and Emergency Response. The program is aimed at reducing municipal solid wastes by promoting waste minimization, recycling collection and the manufacturing and purchase of recycled products. As of 1994, the program had about 300 companies as members, including a number of major corporations. Members agree to identify and implement actions to reduce their solid wastes and must provide EPA with their waste reduction goals along with yearly progress reports. EPA in turn provides technical assistance to member companies and allows the use of the

WasteWi\$e logo for promotional purposes. (Contact: Lynda Wynn, 202-260-0700 or the WasteWi\$e Hotline at 1-800-372-9473)

### *Climate Wise Recognition Program*

The Climate Change Action Plan was initiated in response to the U.S. commitment to reduce greenhouse gas emissions in accordance with the Climate Change Convention of the 1990 Earth Summit. As part of the Climate Change Action Plan, the Climate Wise Recognition Program is a partnership initiative run jointly by EPA and the Department of Energy. The program is designed to reduce greenhouse gas emissions by encouraging reductions across all sectors of the economy, encouraging participation in the full range of Climate Change Action Plan initiatives, and fostering innovation. Participants in the program are required to identify and commit to actions that reduce greenhouse gas emissions. The program, in turn, gives organizations early recognition for their reduction commitments; provides technical assistance through consulting services, workshops, and guides; and provides access to the program's centralized information system. At EPA, the program is operated by the Air and Energy Policy Division within the Office of Policy Planning and Evaluation. (Contact: Pamela Herman, 202-260-4407)

### *NICE<sup>3</sup>*

The U.S. Department of Energy and EPA's Office of Pollution Prevention are jointly administering a grant program called The National Industrial Competitiveness through Energy, Environment, and Economics (NICE<sup>3</sup>). By providing grants of up to 50 percent of the total project cost, the program encourages industry to reduce industrial waste at its source and become more energy-efficient and cost-competitive through waste minimization efforts. Grants are used by industry to design, test, demonstrate, and assess the feasibility of new processes and/or equipment with the potential to reduce pollution and increase energy efficiency. The program is open to all industries; however, priority is given to proposals from participants in the pulp and paper, chemicals, primary metals, and petroleum and coal products sectors. The program has worked with the iron and steel industry to evaluate the feasibility of an on-site hydrochloric acid recovery system for galvanizers and small- to medium-sized steel manufacturers. (Contact: Bill Ives at DOE's Golden Field Office, 303-275-4755)

## **VII.B. EPA Voluntary Programs**

### *Strategies for Pulp & Paper and Steel Industries*

The U.S. Department of Energy is examining the relationships between productivity, energy efficiency and environmental compliance in the pulp

& paper and steel industries. Productivity and energy efficiency investments often complement each other, but can conflict with end-of-pipe emission control projects designed to reduce regulated pollutants. By sponsoring this project, the DOE seeks to better understand such conflicts and use this information to help identify ways DOE and other federal agencies can help industry meet mutual goals in these important areas. The project consists of two phases: 1) industry field consultations will be conducted to discuss and clarify the issues; and 2) quantitative analysis will evaluate the interplay between productivity, energy efficiency, and pollution abatement investments. (Contact: Jeff Dowd at 202-586-7258)

### **VIII.C. Trade Association/Industry Sponsored Activity**

#### **VIII.C.1. Industry Research Programs**

Without technological changes, the requirements of the Clean Air Act affecting coke ovens may force the shutdown of many facilities. To avoid possible facility closings, the industry is actively investigating alternatives to the conventional coke-oven/blast furnace method of making iron. One promising technology, the direct steelmaking project which was jointly funded by the American Iron and Steel Institute (AISI) and the U.S. Department of Energy (DOE), concluded on March 31, 1994. This technology reduces, melts, and refines iron in a single reactor. An opt-in, DOE cost-sharing program for the smelting of steel plant waste oxides began on April 1, 1994. Based on the success of recent trials, and the further knowledge that was gained from this follow-on program, the technology is now well understood and fully developed. A feasibility study for a demonstration plan is being developed. Under a related project, the AISI and member companies are working with the U.S. Bureau of Mines on a jointly funded research project to improve the dewatering of a variety of steel plant sludges. Currently, the sludges contain too much moisture to permit economic recycling to recover metal values. (Contact: Dave Rice 801-584-4130).

Another cokeless ironmaking technology, called the Cipcor or Corex process, eliminates the need for a coke plant, has integral coal desulfurizing, is amenable to a variety of coal types, and produces a gas that can be used to fire a cogeneration plant. This project will begin in 1995; capital outlays are expected to reach \$800 million. Under the DOE Clean Coal Technology Demonstration Program, the Corex construction project may receive a \$150 million grant. For more information on the DOE project, contact J. Lee Bailey (216) 447-3235.

Instead of eliminating coke production, two research projects run by Bethlehem Steel are focused on reducing coke process emissions. The Sparrows Point facility on Chesapeake Bay was the proposed site for one project. At this facility, the Davy Still Autoprocess for pre-combustion

cleaning of coke ovens was to be demonstrated. This process utilizes coke oven battery process water to strip ammonia and hydrogen sulfide from coke oven emissions. The facility was constructed but is not in operation due to a suspension of coke-making operations by Bethlehem Steel at that facility. Discussions are ongoing over re-establishment of coke production at Sparrows Point. The other Bethlehem Steel project is a demonstration plant of the British Steel blast furnace granulated coal injection process. In this process, granulated coal is used instead of oil and natural gas in the blast furnace. Unlike natural gas, granulated coal does not cause furnace temperature reductions when it is introduced and thus improves process efficiency. Pollutant outputs are reduced as coal sulphur is removed by flux and bound in the slag. The process replaces natural gas usage and reduces 40 percent of the coke requirement. The project facility, located in Burns Harbor, Indiana, is expected to be complete in January of 1995. The EPA project manager for the Bethlehem Steel projects is Jeff Summers (301) 903-4412.

Another project focussing on reduced emissions from cokemaking is a process under development by Calderon Energy. A small scale oven was constructed and operated in Alliance, Ohio and a full scale oven is under consideration for funding by the Department of Energy (DOE). For further DOE information, contact John Augustine (412) 892-4524.

**VIII.C.2. Summary of Trade Associations**

American Iron and Steel Institute  
1101 17th Street, NW  
Washington, DC 20036-4700  
Phone: (202) 452-7100  
Fax: (202) 463-6573

Members: 50 companies  
Staff: 44  
Budget:  
Contact: Bruce Steiner,  
VP-Environment and Energy

The American Iron and Steel Institute (AISI), founded in 1908, mainly represents integrated iron and steel manufacturers. Based on tonnage of production, AISI represents the companies responsible for 70 percent of U.S. steel manufacture. As the major trade group for the industry, AISI has a diverse agenda. The AISI conducts market development by working with major customer groups (e.g., automotive, machinery) to maintain and promote steel as the material of choice. The AISI is also involved in legislative and regulatory activities; AISI members rely on the organization to keep them abreast of legislative and regulatory developments. The AISI conducts research on manufacturing technology, basic materials, environmental quality control, energy, and fuel consumption. The AISI also compiles industry (including non-members) statistics through surveys. AISI publications are the *American Iron and Steel Institute-Annual Statistical Report*, as well as technical manuals and pamphlets on steel. The AISI holds several meetings and other workshops and seminars for member company representatives.

Specialty Steel Industry North America  
3050 K Street, NW  
Suite 400  
Washington, DC 20007  
Phone: 202-342-8630  
Fax: 202-338-5534

Members: 21 companies

The Specialty Steel Industry of North America (SSINA) is a national trade organization comprised of 21 producers of specialty steel products, including stainless, electric, tool, magnetic, and other alloys. SSINA represents over 90 percent of the North American specialty steel industry. The primary purpose of SSINA is to promote and encourage a better understanding between members of the North American specialty steel industry and federal and state officials, and to provide and encourage governmental action in support of the continued growth of a strong North American specialty steel industry. SSINA is comprised of a number of task forces and committees which pursue issues of interest to the North American specialty steel industry, including domestic and international trade, environmental, critical materials matters, manufacturing and standards issues, and other government-related matters. The SSINA committees meet quarterly, normally alternating between Washington, D.C. and Pittsburgh.



Steel Manufacturers Association (SMA)  
1730 Rhode Island Avenue, NW  
Suite 907  
Washington, DC 20036-3101  
Phone: 202-296-1515  
Fax: 202-296-2506

email: steelnet@aol.com  
World Wide Web home page:  
<http://www.steelnet.org>  
Members: 55

The SMA is the primary trade association of electric arc furnace steelmakers. Last year, EAF steelmakers recycled 38.2 million metric tons of iron and steel scrap. Purchased scrap accounts for almost 100% of the feedstocks used in an EAF to make new steel. Other SMA companies are reconstituted integrated (ore-based) steelmakers, with management practices similar to those of the EAF companies. The SMA Environment Committee meets frequently to address issues affecting the steel industry and works with the EPA and other government agencies to implement effective environmental programs. The SMA also has technical and human resources committees which meet to exchange information and develop public policy positions, as well as ad-hoc task forces to handle specific matters such as radioactive scrap detection, development of emission monitoring protocols, and the EPA's Common Sense Initiative. With 44 U.S., 8 Canadian, and 3 Mexican member companies geographically dispersed across the continent, the SMA is the largest steel trade association in North America in terms of membership. In 1994, the SMA membership accounted for approximately 40% of all steel shipments in the U.S., and as a growing segment of the industry, the SMA share of total U.S. steel production is expected to account for 50% within one decade.

International Iron and Steel Institute  
Institut International du Fer et de l'Acier  
120, rue Colonel Bourg, B-1140  
Brussels, Belgium 32 2 726 50 95

Members: 165  
Staff: 20  
Budget:  
Contact: Ian Christmas, Deputy  
Secretary General

The International Iron and Steel Institute (IISI) is comprised of steel-producing companies, affiliated federations, and technical societies in 48 countries. The IISI seeks to contribute to the steel industry worldwide. Major functions are: to provide a forum for free and open discussions of the industry's problems and opportunities; to undertake research in scientific, technological, economic, financial, governmental, sociological, legal, environmental, and other aspects of the industry; to collect, evaluate, and disseminate statistics and information concerning matters affecting the steel industry; to establish and maintain liaisons with other organizations related to steel; to promote the use of steel. Some IISI committees include Economic Studies, Environmental Affairs, and Industrial Relations. The IISI publishes the monthly *Iron and Crude Steel Production* (in English) and the annuals *Steel Statistical Yearbook* (in English) and *World Steel in Figures* (in English). IISI also publishes conference proceedings and reports on the following issues: environment, economics, raw materials, technology, market

promotion, and public relations. The IISI holds an annual world conference.

Association of Iron and Steel Engineers	Members: 10,000
3 Gateway Center, Suite 2350	Staff: 19
Pittsburgh, PA 15222	Budget: \$2,500,000
Phone: (412) 281-6323	
Fax: (412) 281-4657	

The Association of Iron and Steel Engineers (AISE) consists of engineers, operators, and suppliers in the steel industry. Founded in 1907, this association works to improve the technical phases of the production and processing of iron and steel via technical reports and industry awards. Divisions include Environmental Engineering, Steel Producing, and Continuous Casting. AISE publications include a monthly, *Iron and Steel Engineer* and a *Directory of Iron and Steel Plants*. Conferences are semi-annual.

#### Additional Related Associations

ASM International  
9639 Kinsman Rd.  
Materials Park, OH 44073-0002  
Phone: (216) 338-5151

Society for Mining, Metallurgy, and Exploration, Inc. (SME, Inc.)  
P.O. Box 625002  
Littleton, CO 80162-5002  
Phone: (303) 973-9550

The Mining Metals and Materials Society (TMS)  
420 Commonwealth Drive  
Warrendale, PA 15086  
(412) 776-9000



**IX. CONTACTS/ACKNOWLEDGMENTS/RESOURCE MATERIALS**

For further information on selected topics within the iron and steel industry a list of contacts and publications are provided below.

**Contacts<sup>e</sup>**

<b>Name</b>	<b>Organization</b>	<b>Telephone</b>	<b>Subject</b>
Maria Malave	EPA/OECA (Office of Enforcement and Compliance Assurance)	202-564-7027	Regulatory requirements and compliance assistance
Steve Sisk	NEIC (National Enforcement Investigations Center)	303-236-3636 ext. 540	Regulatory requirements and industrial processes
James Maysilles	EPA/OAR (Office of Air and Radiation)	919-541-3265	Regulatory requirements (air)
Bernard Caton	EPA/OW (Office of Water)	202-260-7849	Regulatory requirements (water)
Gobind Jagtiani Jeff Dowd	DOE (Department of Energy)	202-586-1826 202-586-7258	Energy efficiency and environmental compliance
Bruce Steiner	AISI (American Iron and Steel Institute)	202-452-7100	Environment and energy
Javier Garcia	EPA/Region IV	404-347-3555	Inspections, regulatory requirements (RCRA)
Ed Wojciechowski	EPA/Region V	312-886-6785	Inspections, regulatory requirements (air)
Gerald Houck	U.S. Bureau of Mines	202-501-9439	Industrial processes
	U.S. Bureau of Mines: Center for Health and Safety	412-892-6602	Health and safety issues

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<sup>e</sup> Many of the contacts listed above have provided valuable information and comments during the development of this document. EPA appreciates this support and acknowledges that the individuals listed do not necessarily endorse all statements made within this notebook.

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**Process Descriptions and Chemical Use Profiles**

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U.S. EPA, Office of Air and Radiation, Office of Air Quality Planning and Standards, *Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources, Metallurgical Industry*, Research Triangle Park, NC, U.S. Government Printing Office, Washington, D.C., September 1985.

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Rimer, A.E. and L.A. Reinders, *A Practical Guide to Pollution Prevention Planning for the Iron and Steel Industries*, Blasland, Bouck & Lee, Chapel Hill, N.C., 1992.

Air & Waste Management Association, *Hazardous Waste Minimization Industrial Overviews*,

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*Iron and Steel Engineer*

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*World Steel Dynamics*, (212) 713-2498

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## Endnotes

1. Variation in facility counts occur across data sources due to many factors including, reporting and definitional differences. This notebook does not attempt to reconcile these differences, but rather reports the data as they are maintained by each source. Only preliminary data is available from the *1992 Census of Manufactures*. The final version which includes all data will not be available until mid-1995. *Census of Manufactures*, U.S. Department of Commerce, Bureau of the Census, Preliminary Report Industry Series, MC92-I-33A(P) (Industries 3312, 3313, 3315, 3316, and 3317), 1994.
2. *Annual Statistical Report*, American Iron and Steel Institute, Washington, D.C., 1993.
3. *Net Shipments of Steel Mill Products*, table, American Iron and Steel Institute, Washington, D.C., 1994.
4. *Report on Steel Industry Waste Generation, Disposal Practices, and Potential Environmental Impact*, American Iron and Steel Institute, Washington, D.C., February, 1992.
5. *Census of Manufactures*, U.S. Department of Commerce, Bureau of the Census, Industry Series, MC87-I-33A (Industries 3312, 3313, 3315, 3316, and 3317), 1987.
6. *U.S. Industrial Outlook*, U.S. Department of Commerce. Washington, D.C., 1994, p. 13-1.
7. Ibid, p.13-1.
8. Ibid, 13-3.
9. Ibid, p. 13-5.
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11. *Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources, Metallurgical Industry*, U.S. Environmental Protection Agency, Office of Air and Radiation, Office of Air Quality Planning and Standards, Research Triangle Park, NC, U.S. Government Printing Office, Washington, D.C., September 1985.
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27. *Report to Congress on Metal Recovery, Environmental Regulation and Hazardous Waste*. U.S. EPA, Office of Solid Waste and Emergency Response, 1994, p.20 (EPA 530-R-93-018).
28. *Hydrochloric Acid Recovery System for Galvanizers and Steel Manufacture*, U.S. Department of Energy, NICE<sup>3</sup> (National Industrial Competitiveness through Energy,

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31. *Sustainable Environmental Law*, Environmental Law Institute, West Publishing Co., St. Paul, MN, 1993, p.1238.

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33. Ibid, p. 23.

34. Ibid, p. 44.